# LE Audio: The Future of Bluetooth® Audio

**Bluetooth®** | **ABi**research®
THE TECH INTELLIGENCE EXPERTS™

# Table of Contents

**Bluetooth®**

**ABI**research.
THE TECH INTELLIGENCE EXPERTS™

**Andrew Zignani**
*Principal Analyst*

*As Research Director for ABI Research's Strategic Technologies team, Andrew Zignani conducts research into the rapidly changing wireless connectivity market, with a particular emphasis on market forecasts and qualitative insight covering Bluetooth® technology, Wi-Fi, 802.15.4, Near Field Communications (NFC), HaLow, UWB, and other emerging wireless standards and protocols. Andrew also writes reports on the technological evolution and long-term prospects for wireless connectivity technologies, particularly as they increasingly target new verticals across the Internet of Things (IoT).*

# Introduction

Since its inception, audio has represented the largest solution area for *Bluetooth®* technology. Initially, synonymous with hands-free calling and wireless headsets, Bluetooth audio technology has continuously evolved to support higher quality audio use cases, most notably within mobile to headphone and speaker streaming, enabled by the Advanced Audio Distribution Profile (A2DP). As a result, Bluetooth audio has become widely adopted in 100 percent of smartphones, tablets, and PCs and billions of wireless headsets and speakers. Both use cases have traditionally leveraged Bluetooth Classic technology, also known as Bluetooth Basic Rate / Enhanced Data Rate (BR/EDR).

Over the last decade, various new use cases and requirements for audio have emerged. This includes true-wireless stereo (TWS) earbuds, hearing aids, and networked speakers, among others. However, Bluetooth Classic Audio has several limitations, including audio quality, power consumption, an inability to support simultaneous connections, unidirectional streaming, and issues in handover between audio and voice applications. Yet, both a strength and limitation of Bluetooth Classic Audio and A2DP is that it is designed to be a point-to-point technology.

To better serve these use cases, various companies developed their own proprietary extensions to Bluetooth Classic Audio technology, bringing synchronization between earbuds to create new device categories such as TWS earbuds and hearables, which first arrived in 2014. Since then, these devices propelled the Bluetooth audio market to new heights, with the TWS earbuds and hearable markets alone shipping over 200 million units in 2021.

## 200 MILLION

TWS earbuds and hearables shipped in 2021

Source: ABI Research

In the hearing device space, Bluetooth Classic Audio's high power consumption meant that it was an ill-fit solution to size- and power-constrained devices, such as hearing aids and cochlear implants, which are typically worn for up to nine hours a day. As a result, companies such as Apple and Google developed their own hearing aid solutions based on the Bluetooth Low Energy (LE) radio, enabling hearing aid users to stream music and phone calls directly to their hearing aid while providing sufficient battery life for daily use. While the arrival of these solutions has been positive for consumer earbuds and hearing devices, the fact that they are tied to proprietary technologies and vendor-specific ecosystems means they lack interoperability and consumer choice is limited.

In 2014, the hearing aid industry under EHIMA (European Hearing Industry Manufacturers Association) joined the Bluetooth Special Interest Group (SIG) to develop a new standard for hearing aids. The intention was to enable hearing device users to receive high-quality

voice and media audio via Bluetooth technology, without the need for separate accessories, directly to these devices and ensure interoperability with any brand that used the technology. Following these initial developments, it soon became clear that developing a new audio standard could also bring significant benefits to the wider consumer audio market and address many of the limitations of Bluetooth Classic Audio. This has since evolved into the largest specification project in the history of Bluetooth technology — LE Audio.

The arrival of LE Audio is set to transform the Bluetooth audio ecosystem over the next five-to-ten years. As the name suggests, rather than leveraging the Bluetooth Classic radio, LE Audio operates on the Bluetooth LE radio thanks to a number of new features introduced in Bluetooth® Core Specification version 5.2. These features support improved audio quality, reduced power consumption, improved interoperability, easier development of hearing aids and TWS earbuds, new audio device types, and the emergence of Auracast™ broadcast audio which enables public and private broadcast use cases for consumer and assistive listening applications.

# Bluetooth® Audio Market Forecasts

Chart 1 below shows ABI Research's market forecasts for Bluetooth® peripheral audio devices over the next five years. The main devices in this forecast include those where receiving audio is the primary function, such as TWS earbuds, headsets, speakers, and hearing aids. By 2027, ABI Research forecasts there will be nearly 1.5 billion annual shipments of Bluetooth peripheral audio devices with over 730 million TWS earbuds, 208 million voice-control front ends, 192 million speakers, and 179 million hearables accounting for 94 percent of this market.

## 1.5
# BILLION
annual shipments of Bluetooth® peripheral audio devices in 2027
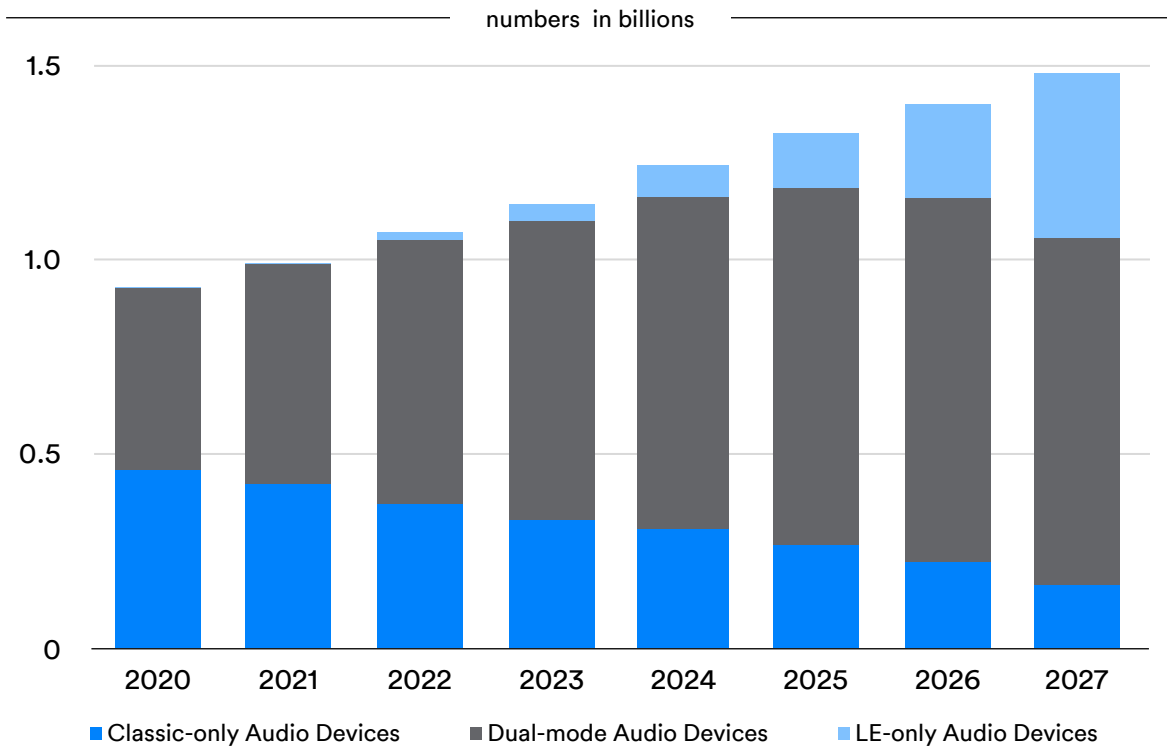
Source: ABI Research

### Chart 1: Bluetooth® Peripheral Audio Device Shipments

numbers in billions
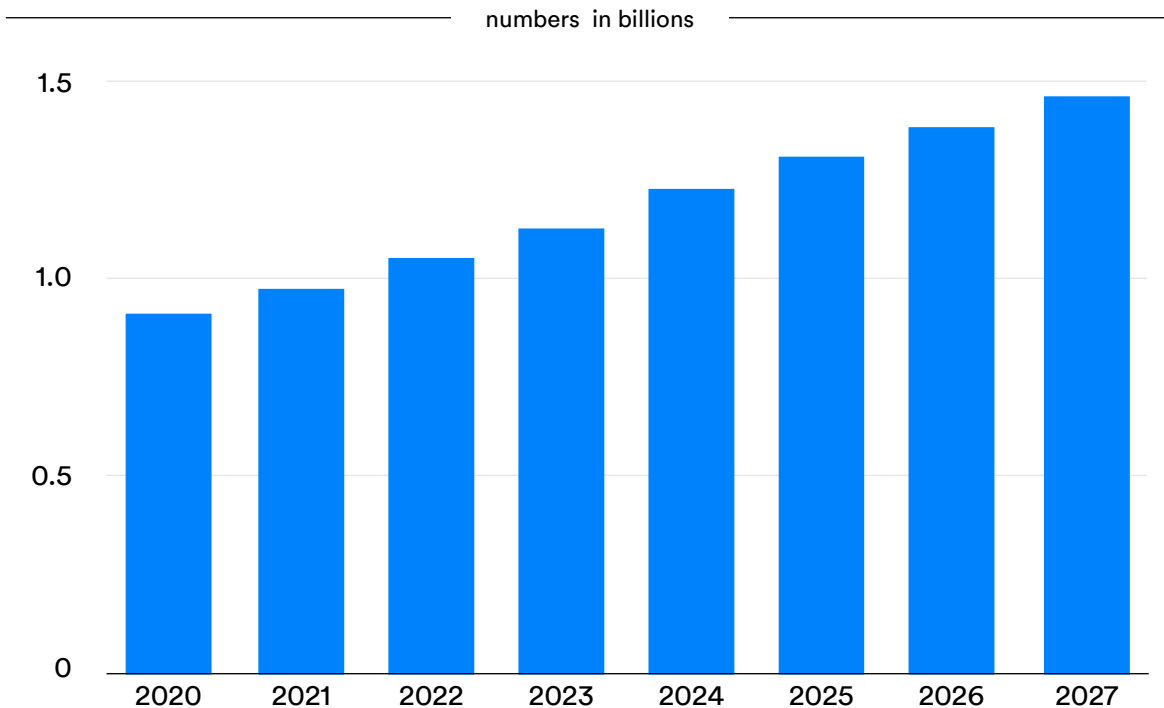


Source: ABI Research, *excludes platform & transmitter devices*

# Mapping the Transition from Classic Audio to LE Audio

## Chart 2: Bluetooth® Peripheral Audio Device Shipments by Radio Technology

numbers in billions



Legend: ■ Classic-only Audio Devices  ■ Dual-mode Audio Devices  ■ LE-only Audio Devices

*Source: ABI Research*

## Dual-Mode Bluetooth® Audio to Lead the Way

Chart 2 shows Bluetooth® peripheral audio device segmented by the different Bluetooth radio technologies. While Bluetooth Classic has dominated the market historically, in recent years, many audio device manufacturers have begun to adopt dual-mode Bluetooth Classic and LE radio solutions.

While Bluetooth Classic is typically used to stream audio, Bluetooth LE can be used for faster pairing, media control, and to enable location functionality in order to track earbuds. Most leading Bluetooth wireless chipset vendors addressing the audio market today offer dual-mode radio solutions (i.e., Bluetooth Classic + Bluetooth LE) as part of their product portfolios. Over time, these dual-mode radio solutions will increasingly support LE Audio functionality and become dual-mode audio solutions (i.e., Classic Audio + LE Audio). This will help to enable new Auracast™ broadcast audio use cases while allowing vendors to continue

to innovate on their product offering via additional features and performance differentiators. Furthermore, this dual-mode strategy will help these leading vendors retain their strong market presence throughout the LE Audio transition in source devices. Until most source devices have transitioned to support LE Audio, it makes little sense for incumbent vendors to commit fully to a single-mode LE solution and limit their addressable market to those with LE Audio source devices. At the same time, dual-mode solutions can enable new Auracast™ broadcast audio capability when used with source devices or public transmitters that support LE Audio. As a result, as Chart 2 shows, dual-mode audio devices are expected to account for the most significant portion of the Bluetooth audio market throughout the forecast period.

## Standalone LE Audio Will Emerge Over Time

ABI Research also expects a third category of LE Audio-only devices will emerge. These devices will take full advantage of the new LE Audio features and differentiate in areas such as power consumption and cost. There are a number of Bluetooth® chipset suppliers who have emerged since the arrival of Bluetooth LE and have not had a Bluetooth Classic Audio portfolio or significant market share in the audio market. Here, there may be some new opportunities to get ahead of the curve and build a new presence in the LE Audio space. These chipset vendors have little to lose in terms of existing market share. Therefore, they can target new opportunities in a growing market across the hearing aid, true-wireless, and broadcast audio ecosystem.

One of LE Audio's greatest achievements will be to open up the audio market to new entrants and make it easier to develop lower cost, lower complexity, non-proprietary products that have better synchronization, lower latency, improved power consumption, and that can enable new capabilities such as Auracast™ broadcast audio and assistive listening use cases in public venues. In addition, some incumbent vendors may offer separate LE Audio-only solutions alongside their dual-mode solutions. However, as Chart 2 shows, it will likely be post 2025 before LE Audio single-mode devices gain appreciable traction as it will rely on a significant installed base of LE Audio-capable source devices to emerge.

## The Ecosystem Approach

Another potential strategy for LE Audio's smooth rollout will be an ecosystem play. Those who operate on both sides of the source and sink ecosystem could bundle LE Audio-only sink solutions in-the-box with a new smartphone, tablet, PC, smartwatch, or other source device. Here, device OEMs can help differentiate their source products by enabling new broadcast use cases, such as personal audio sharing, as well as on the sink device by enabling Auracast™ broadcast audio functionality alongside reduced power consumption, smaller form factors, and higher quality audio. This will ensure that users will be able to connect to an LE Audio source and provide unique LE Audio experiences before waiting for the rest of the industry to adopt LE Audio en-masse.

## A Multi-Strategy Approach to LE Audio

ABI Research believes that LE Audio will open up different strategies and approaches depending on the vendor's history in the audio market, their existing audio portfolio, and their position in the audio ecosystem. Chipset vendors active in the smartphone realm have the potential to adopt a system-wide approach which may include radio-specific innovations in conjunction with LE Audio support. LE Audio will also open up the potential for new vendors to enter this space and create new ways of differentiation.

Some vendors may embed LE Audio as part of their dual-mode solution primarily thanks to its Auracast™ broadcast audio capabilities. Others may continue to use dual-mode until the installed base of LE Audio devices becomes strong enough to switch to LE-only solutions. Those without a legacy Bluetooth® Classic portfolio or market share may take the initial plunge into LE Audio solutions. Others could deploy an ecosystem approach that ships LE Audio-only headsets in-box with LE Audio-capable smartphones to differentiate from other models and gain market share from other OEMs.

Hearing aid vendors will use LE Audio-only solutions thanks to the reduced power consumption. In addition, several dual-mode products already on the market have announced they will be able to upgrade via OTA updates to support the new features of LE Audio. Therefore, there is unlikely to be a uniform transition across all device types.

Ultimately, instead of a static uniform transition towards LE Audio-only devices, LE Audio will likely integrate into the existing Bluetooth audio market as part of the wider innovation in the audio landscape over the next five-to-ten years. Rather than there being a clear distinction between Bluetooth LE Audio and Classic Audio, what is likely to occur is a merging of both technologies where devices will differentiate in different areas, such as use cases, audio quality, latency, power consumption, size, and cost.

# Building a Bluetooth® LE Audio Ecosystem

### Chart 3: Bluetooth® LE Audio Device Shipments by Supported Audio Modes

numbers in billions



Legend: ■ LE Audio Dual-Mode Devices ■ LE Audio Single-Mode Devices
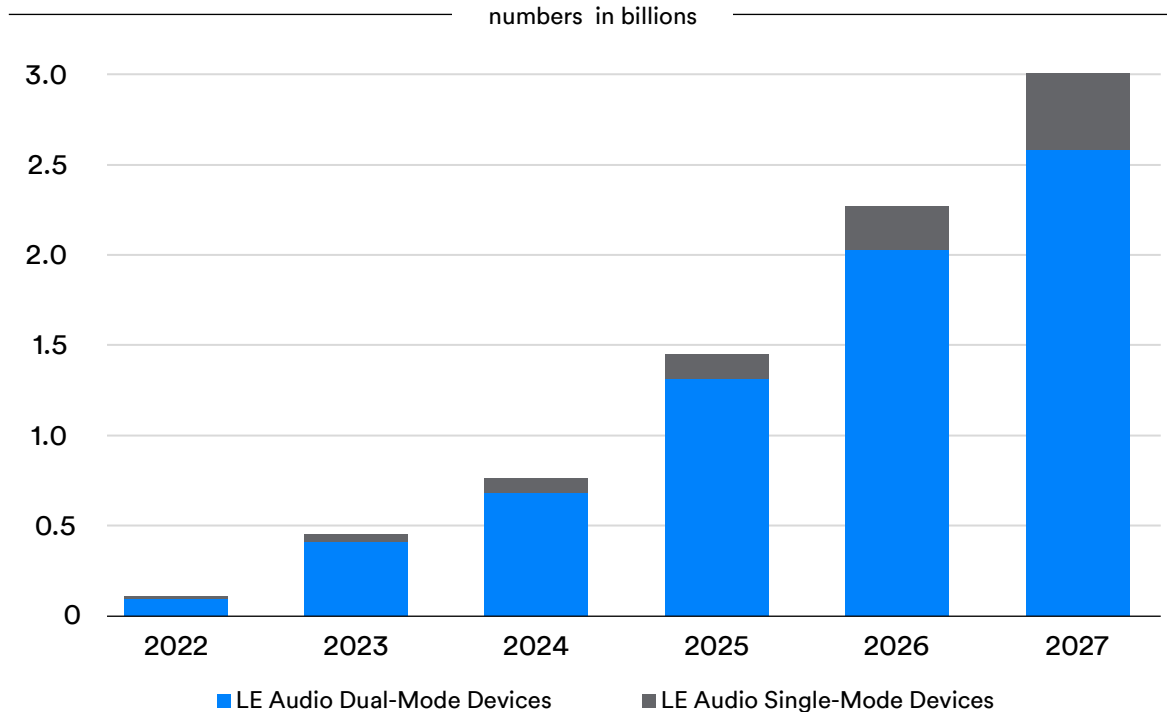
*Source: ABI Research*

The LE Audio ecosystem is still very much in its initial development phase. Nonetheless, chipset, IP, and product announcements point towards a strong ecosystem for LE Audio emerging over the next 12-18 months. As of early September 2022, there were 103 listings, and growing, of Bluetooth® products supporting the LC3 codec. This includes a range of headsets, earbuds, soundbars, speakers, audio transmitters, smartphones, and tablets, among other devices, alongside chipsets and modules.

# 3 BILLION
LE Audio device shipments in 2027

Source: ABI Research

ABI Research forecasts that annual LE Audio source and sink device shipments will reach three billion by 2027. As Chart 3 demonstrates, of the three billion LE Audio device shipments in 2027, 86 percent are still expected to support dual-mode Bluetooth audio. Source devices will continue to support Bluetooth Classic Audio and LE Audio via dual-mode chipsets for the foreseeable future. This

will enable them to take advantage of new LE Audio and Auracast™ broadcast audio use cases while ensuring compatibility with the existing ecosystem of Bluetooth Classic Audio devices on the market today. Sink devices will increasingly support standalone LE Audio solutions as the installed base of LE Audio devices continues to grow.

Chart 4 shows LE Audio device shipment forecasts by market segment. Source devices – such as smartphones, tablets, PCs, and televisions – alongside sink devices – such as TWS earbuds, headsets, and hearing aids – will likely be the first major device categories to adopt LE Audio. Source devices will be quick to embed Bluetooth® Core Specification version 5.2 and above in their platforms, and many source solutions that embed version 5.2 and 5.3 have already been deployed on the market today. For example, Qualcomm's FastConnect 6900 and FastConnect 7800 SoCs support LE Audio. MediaTek's Filogic 380 Wi-Fi 7 / Bluetooth Core Specification version 5.3 solution that targets smartphones, tablets, laptops, PCs, and wearables also supports LE Audio, as does Broadcom's BCM4398 Wi-Fi 7 / Bluetooth® Core Specification version 5.2 combo chip.

In addition, on the sink side, Qualcomm's flagship Bluetooth earbud platforms, the QCC5171 and QCC307x, all support LE Audio. All of these solutions are dual mode and support Qualcomm's existing Bluetooth Classic innovations alongside LE Audio's broadcast capabilities. In July 2022, Airoha announced qualification of its flagship and professional series of LE Audio products designed to target headphones, TWS, speakers, hearing devices, and transmitters. This follows other LE Audio product announcements from Nordic Semiconductor, Realtek, Telink Semiconductor, Bluetrum, and Bestechnic, among other vendors.

Other categories, such as TVs, smartwatches, speakers, and voice-control front ends, will likely follow this initial wave of adoption. In the longer term, there is likely to be an additional wave of smart home and IoT products that embed LE Audio technology to enable innovative methods of interaction. This could include smart appliances or security systems that notify homeowners of key status updates, sensor devices that provide activity or measurement readouts, and other use cases that have yet to be considered.
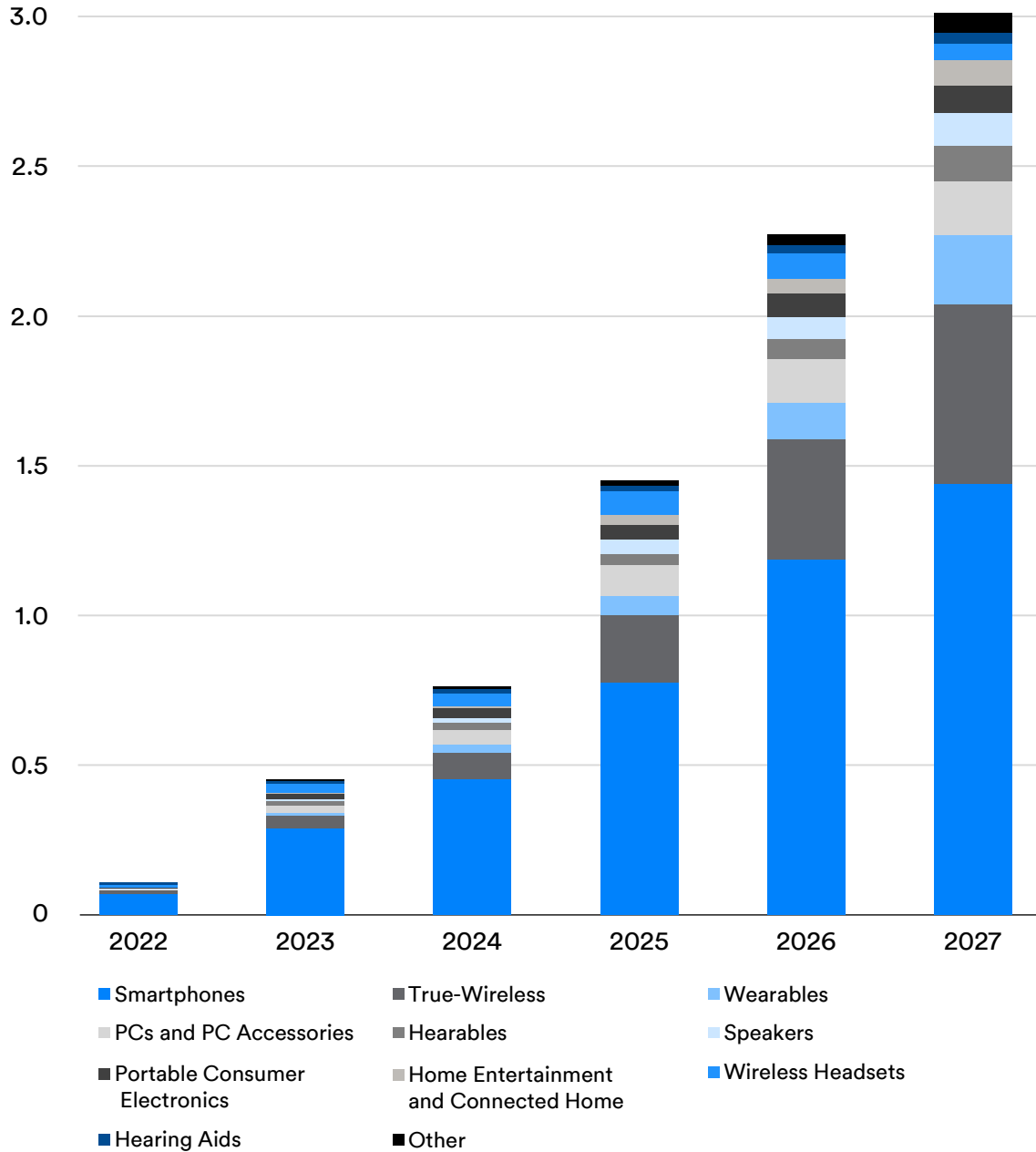
# 85%

## OF LE AUDIO DEVICES

shipped annually are expected to support dual-mode Bluetooth® audio in 2027

Source: ABI Research

## Chart 4: Bluetooth® LE Audio Device Shipments by Market Segment

numbers in billions



Legend:
- Smartphones
- True-Wireless
- Wearables
- PCs and PC Accessories
- Hearables
- Speakers
- Portable Consumer Electronics
- Home Entertainment and Connected Home
- Wireless Headsets
- Hearing Aids
- Other

*Source: ABI Research*

# New Market Opportunities Enabled by Auracast™ Broadcast Audio

Arguably, the most significant new capability enabled by the release of LE Audio is Auracast™ broadcast audio. Thanks to LE Audio's broadcast capabilities, audio transmitters can broadcast one or several audio streams to an unlimited number of Auracast™ receivers, such as headsets and hearing aids. This will help create new ways to interact with our environments, improve visitor experiences, and offer scalable assistive listening solutions that could eventually supersede existing options and open up wider accessibility for people with hearing loss.

Opportunities for Auracast™ broadcast audio are enormous, with the technology envisioned to be leveraged across a wide number of public locations. This could include conference and lecture halls, theatres and cinemas, airports and transportation hubs, museums, places of worship, and, eventually, in one-to-one type deployments within retail and other service environments. According to the World Health Organization, over 1.5 billion people globally (nearly 20 percent of the population) live with hearing loss. This is anticipated to grow to 2.5 billion as early as 2050. LE Audio has the potential to significantly build upon and complement existing assistive listening solutions and open up Auracast™ broadcast audio to many new venues and regions that currently have limited or no assistive listening infrastructure.

### Auracast™ Broadcast Audio Use Cases

The Bluetooth SIG identified five major initial Auracast™ broadcast audio use cases, highlighted in Table 1 below. It is likely, as the market develops and the installed base of Auracast™ broadcast audio devices grows, new use cases beyond these will emerge and build traction in the market.

| Use Case | Description |
|---|---|
| Augmented/ Assistive Listening in Public Venues | The primary promoted use case for Auracast™ broadcast audio is for it to become a high-quality, lower-cost augmented and assistive listening technology in venues where a public address (PA) or hearing loop infrastructure is currently deployed. Thanks to the connectionless broadcast capabilities of LE Audio, unlimited numbers of users will be able to effectively tune into various audio streams using their own devices within public venues. |
| Multi-Language Support | Somewhat of a subsegment of the public space use cases, Auracast™ broadcast audio has the potential to be leveraged as a multi-language technology in locations that support simultaneous translation services. Users will be able to tune into a relevant stream that can provide information and audio in their preferred language. Typical use cases for this would include conference centers or cinemas. |

| | |
|---|---|
| Tour Systems | Another potential use case, albeit slightly more niche, is the ability to enable users to join audio tour systems within venues such as museums, stadiums, convention centers, tourist attractions, and more. The tour guide will be equipped with an LE Audio broadcast transmitter, and listeners will be able to listen to the stream with their own earbuds or hearing aids. |
| Silent TV Screens | In addition to the TV streaming use cases for LE Audio within the home, there are many venues around the globe where televisions are installed, but no audio is provided or the audio is hard to hear. LE Audio has the potential to enable users to tune into the audio of that particular screen with their Auracast™ assistant and headset device, enabling better visitor experiences and increased customer satisfaction in these environments. |
| Assistive Listening at Public Counters/ One-to-One | One of the larger but longer-term opportunities for LE Audio will be found within one-to-one or counter-based assistive listening applications. Today, hearing loop solutions can be found in a wide range of public service counters or reception desks. However, the initial focus for LE Audio has been very much on the larger-scale broadcast applications and less on the private, one-to-one solutions. It will, therefore, likely be several years before these solutions are available in significant volumes. |

*Table 1: Key Auracast™ Broadcast Audio Use Cases*

## Auracast™ Broadcast Audio Market Forecasts

Given where we are in the development timeline of LE Audio and Auracast™ broadcast audio, it is still early to establish concrete forecasts on how rapidly the industry will adopt LE Audio across both the transmitter and receiver devices, alongside Auracast™ broadcast audio deployments within public locations and other enterprise use cases. The speed of the rollout of LE Audio solutions in the source and sink devices will have a direct impact on the deployment of Auracast™ broadcast audio solutions in public venues. As the LE Audio source and sink installed base grows, so too will the opportunities for Auracast™ broadcast audio solutions to be increasingly deployed.

In order to understand the potential addressable market for Auracast™ broadcast audio, ABI Research has developed a forecasting model based on global venue market sizing built from a regional model of establishments combined with projected adoption of Auracast™ broadcast audio solutions across different use cases. Here, we have taken into account anticipated penetration across different regions, different timelines for different use cases, and different numbers of transmitters per deployment based on building sizes and the number of potential buildings / rooms per establishment.

According to ABI Research, there are just over 61 million establishments globally that could take advantage of Auracast™ broadcast audio. By 2030,
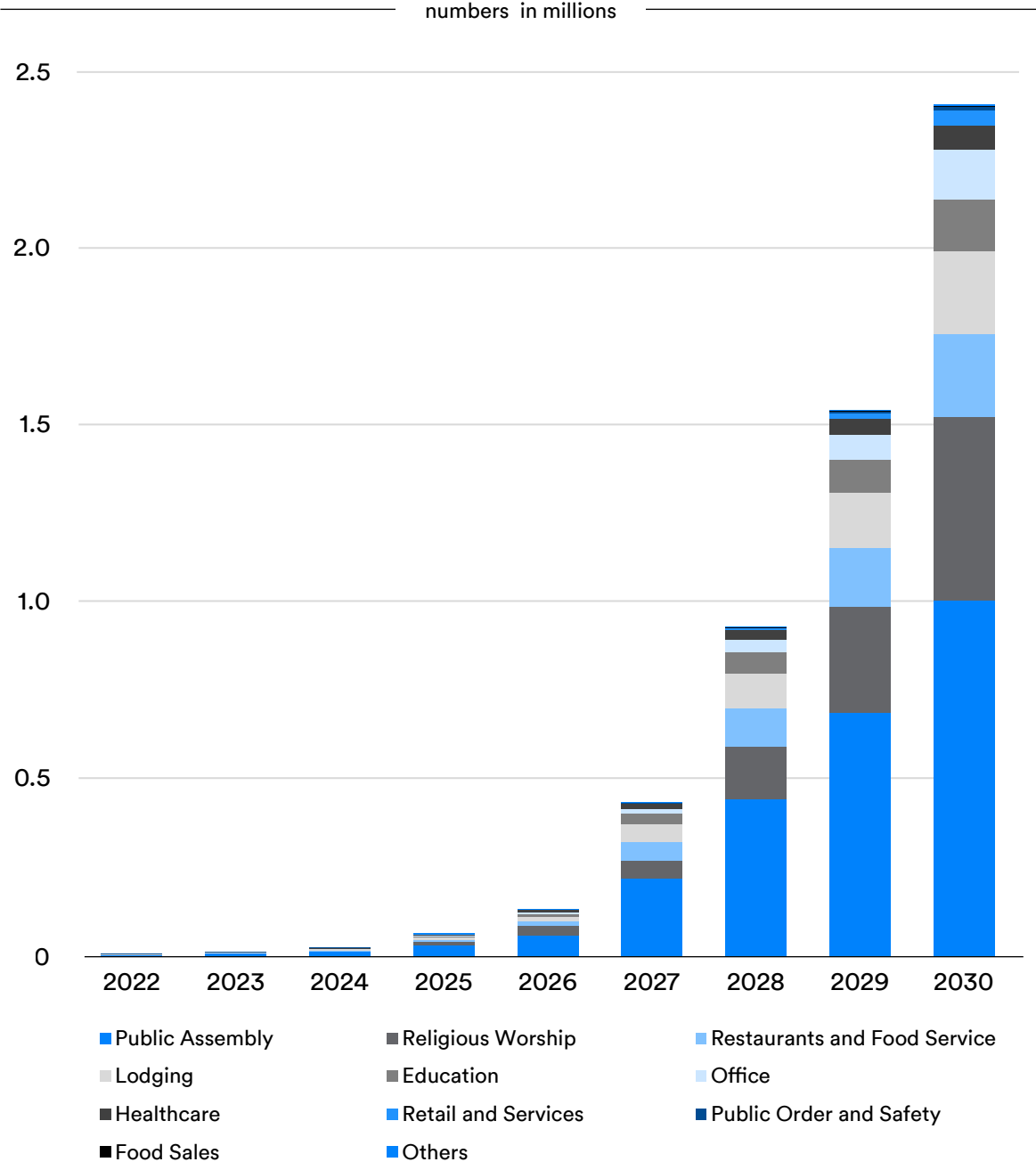
## 61+
## MILLION
establishments globally that could take advantage of Auracast™ broadcast audio today

Source: ABI Research

this number will increase to 64 million thanks to new building growth. However, as Chart 4 previously demonstrated, it will take some time for the ecosystem of LE Audio source and sink devices to develop. ABI Research expects the major inflection point to occur around 2025. Thereafter, there will be additional incentive for venues to start deploying Auracast™ broadcast audio. By this point, the technology will be more familiar, transmitter devices will be more readily available, and the installed base of LE Audio-enabled devices will have reached a critical mass. Therefore, ABI Research expects a more rapid deployment of Auracast™ broadcast audio solutions towards the end of the decade.
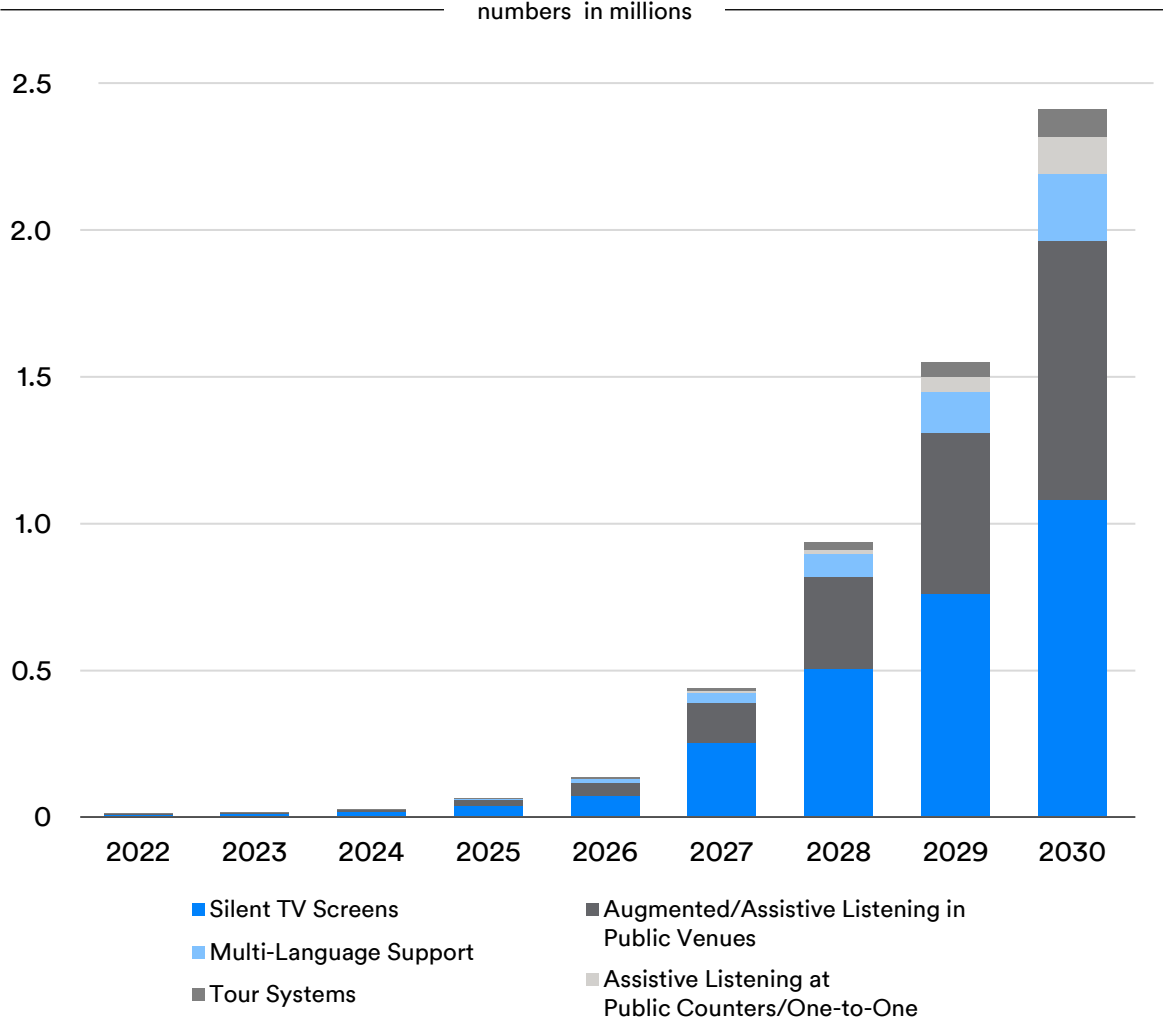
### Chart 5: Total Bluetooth Auracast™ Deployments by Venue Type

numbers in millions



Legend:
- Public Assembly
- Religious Worship
- Restaurants and Food Service
- Lodging
- Education
- Office
- Healthcare
- Retail and Services
- Public Order and Safety
- Food Sales
- Others

As Chart 5 shows, by 2030, ABI Research expects there will be nearly 2.5 million Auracast™ broadcast audio deployments across different venue types. Public assembly deployments are expected to account for nearly 42 percent of deployments at this time, encompassing venues such as libraries, social or meeting venues (e.g., community centers, meeting halls, and convention centers), recreational facilities (e.g., gymnasiums, health clubs, and sports facilities), entertainment and culture (e.g., museums, theaters, cinemas, and sports arenas), and transportation hubs (e.g., airports, railway stations, and bus depots). In terms of the largest opportunities, these venues will be followed by places of worship and closely followed by restaurants/food service and lodging (e.g., hotels, resorts, and nursing and retirement homes).

### Chart 6: Auracast™ Public Location Deployments by Use Case

numbers in millions



Legend:
- ■ Silent TV Screens
- ■ Multi-Language Support
- ■ Tour Systems
- ■ Augmented/Assistive Listening in Public Venues
- ■ Assistive Listening at Public Counters/One-to-One

*Source: ABI Research*

As Chart 6 shows, in this early phase of development, ABI Research expects silent TVs and augmented / assistive listening in public venues to drive Auracast™ broadcast audio adoption. In public assembly buildings, all five major use cases will be relevant; however, by 2030 the majority will come from silent TV screens, assistive listening, and multi-language support. Religious worship will primarily be assistive listening use cases, while restaurants will primarily be silent TV screens in bars and other venues. ABI Research also expects that many other innovative ways of deploying Auracast™ broadcast audio will emerge for both assistive listening and augmented hearing applications over the next decade.

# Conclusion

In order for LE Audio and Auracast™ broadcast audio to become successful, a number of landmarks need to be reached. Firstly, there is, of course, the need for Bluetooth Core Specification version 5.2 and above hardware to proliferate the market. On the source side, this is expected to happen relatively swiftly with most smartphone, tablet, and PC platforms expected to support the technology in the next few years. However, it will take some time for the installed base of these LE Audio devices to grow, and dual-mode Bluetooth® Classic / LE Audio solutions will be necessary in this transition period to ensure compatibility with existing devices while capturing emerging opportunities in the LE Audio space.

Incumbents in the audio space will likely maximize their existing product offerings and incorporate LE Audio functionality via dual-mode solutions, while those without an existing market presence have the opportunity to capture a portion of the audio market via innovative product designs enabled by the key features of LE Audio. Improvements to TWS earbuds and hearing devices could be enabled thanks to the lower inherent power consumption of LE Audio. Over time, more and more standalone LE Audio devices will emerge, leading to innovative user experiences and new use cases for Bluetooth audio.

On the Auracast™ broadcast audio side, significant outreach and education will be needed to encourage venues to adopt Auracast™ broadcast audio as an assistive and augmented listening technology. Given the significantly higher installed base of consumer devices with LE Audio versus hearing aids, it may be worth initially promoting mainstream use cases, such as silent TVs, multi-language support, and other augmented audio experiences, to help drive initial adoption. An ecosystem of system integrators and installers will also need to be formed to help rollout Auracast™ broadcast audio solutions across a larger number of public venues. This will also help to ensure a consistent user experience across many different venue types.

From a regulatory perspective, much work also needs to be done to incentivize Auracast™ broadcast audio as a primary assistive listening technology in various public venues or within new buildings as standard. Developing intuitive user interfaces for Auracast™ broadcast audio will also be critical if it is to become a successful technology, and work needs to be done to ensure that this is as seamless as existing technologies. This will be particularly important in one-to-one use cases where security and privacy are extremely important.

Ultimately, LE Audio should arguably be positioned not as a replacement for existing Bluetooth audio solutions but as an evolutionary enhancement to existing Bluetooth audio capabilities. This will help establish new use cases and consumer experiences, open the audio ecosystem to new industry players, and enable the Bluetooth audio market to scale to new heights.

# Bluetooth Market Research Community

Join the Bluetooth® Market Research Community to receive early access to market data highlighting the latest Bluetooth technology trends and forecasts. You'll also have the chance to weigh in on what data is collected and shared to ensure you receive the research that's most valuable to you and your business.

Subscribe at

**bluetooth.com/marketresearch**